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NOTES ON THE FISHES OF HAWAII WITH DESCRIPTIONS OF SIX NEW SPECIES

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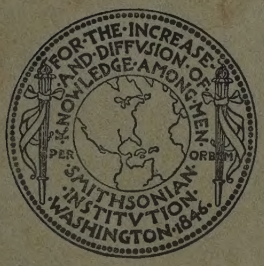

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NOTES ON THE FISHES OF HAWAII, WITH DESCRIPTIONS OF SIX NEW SPECIES

By Eric Knight Jordan

Of Stanford University, California

I

The present writer spent the month of August, 1924, at Honolulu, in company with his father, David Starr Jordan, in attendance at the Pan-Pacific Food Conservation Conference. All his available time was spent in collection and study at the fish markets. Of the large collections obtained, the first series was sent to Cornell University, the second to the University of Minnesota, and smaller series to Chicago University, to the Imperial University of Tokyo, and to Brigham Young University. The types of new species were placed in the United States National Museum, which institution publishes the present notes. The plates are the work of the late William S. Atkinson, artist in zoology and botany, at Stanford University.

The writer is indebted to his father for many suggestions, especially for aid in the determination of species. Prof. Frederick G. Krauss, of the University of Hawaii, has given him important assistance in connection with this work, and the Matson Navigation Company has shown the special courtesy of transporting the collections without charge to San Francisco.

In this paper I have included references to all species added to the Hawaiian fauna since the publication in 1922 of Jordan and Jordan's List of the Fishes of Hawaii.[1] The most important of these additions are recorded in Henry W. Fowler's New or Little Known Hawaiian Fishes.[2] References to the additional species secured by Mr. Fowler on his visit to Honolulu in the autumn of 1922, are made in the present paper. In the time at my disposal, I was able to examine or secure about 220 species, some fishes being too large for convenient preservation. Many of the coral reef fishes

[1] Memoirs of the Carnegie Museum, vol. 10, No. 1, Dec., 1922.
[2] Occasional Papers of the Bernice Pauahi Bishop Museum, vol. 8, No. 7, 1923.

could not be obtained in the time I could spare, and I have reason to believe that overfishing, and, more especially, the use of dynamite, not yet effectually prohibited, has reduced the number of shore fishes to less than one-fourth the abundance noted by Jordan and Evermann in 1901.[3]

To this last work the present paper, and the previous one of Jordan and Jordan, containing the complete list up to 1922, are supplementary.

In this paper the following genera and species are described as new:

Genera: *Leihala*, *Opua*.

Species: *Lepidaplois atrorubens*, *Scaridea farrandi*, *Scarus kraussi*, *Scarus galena*, *Opua nephodes*, *Cantherines verecundus*.

Family EULAMIIDAE

Genus EULAMIA Gill

EULAMIA MUNSING (Bleeker).

Mr. Fowler records this East Indian shark from Hononlulu.

Family ECHINORHINIDAE

Genus ECHINORHINUS Blainville

ECHINORHINUS BRUCUS (Bonnaterre).

Recorded by Fowler from Honolulu.

Family ISISTIIDAE

Genus ISISTIUS Gill

ISISTIUS, species.

Represented by a cast in the Bishop Museum. It is a very small shark with the two dorsals set far back, and very small, about the size of the ventrals which are opposite the interspace; no anal fin.

Family MOBULIDAE

Genus MANTA Bancroft

MANTA BIROSTRIS (Walbaum).

Recorded from Honolulu by Fowler.

Family DUSSUMIERIIDAE

Genus SPRATELLOIDES Bleeker

SPRATELLOIDES DELICATULUS (Bennett).

Recorded by Fowler from Honolulu as *Stolephorus delicatulus*, but the name *Stolephorus* is now regarded as properly assigned to a

[3] The Aquatic Resources of the Hawaiian Islands, Bull. U. S. Fish Commission for 1903. (Issued 1905.)

group of anchovies. As now understood by Jordan and Seale *Stolephorus* differs from the New World anchovies (*Anchoviella*, etc.), in the presence of ventral scutes, these beng absent in all the American species.

Family ENGRAULIDAE

Genus ANCHOVIELLA Fowler

ANCHOVIELLA PURPUREA (Fowler).

This little anchovy, or *Nehu*, is very abundant about Honolulu. It is used as bait, especially for the *Aku*, or Oceanic Bonito (*Katsuwonus pelamys*), the most abundant large fish now in the Honolulu markets. Its coarse red flesh is again used as bait for the various tunnies, spear-fish, and *Ono* (*Acanthocybium*).

Family CHANIDAE

Genus CHANOS Lacépède

The genus *Chanos* is wide spread along the shores of the Pacific from Lower California and Japan to the Red Sea and Australia. Of late it has been assumed that (excepting *Chanos lubina*, which has 19 dorsal rays) all the representatives of the genus belong to one species. This conclusion is at least doubtful, as our Hawaiian and Mexican examples have 86 scales in the lateral line, while the species of the Red Sea (*Mugil chanos* Forskål or *Chanos arabica* Cuvier and Valenciennes), has but 75. This form of the North Pacific may be provisionally regarded as a distinct species, *Chanos cyprinella*.

CHANOS CYPRINELLA Cuvier and Valenciennes.

This form was described from Honolulu ("Onoruru"), where it is a valued food fish, the flesh of an excellent flavor though with many small bones.

Family GONORHYNCHIDAE

Genus GONORHYCHUS (Gronow) Scopoli

GONORHYNCHUS MOSELEYI Jordan and Snyder.

Described and figured by Jordan and Snyder[4] from a specimen taken at Honolulu by Professor Edward Lincoln Moseley. The same species is recorded by Fowler as *Gonorhynchus gonorhynchus*, from which Australian species it differs in the longer head, —4 in length to base of caudal, and in the shading of the fins, the dark area being less extended.

[4] Journ. Wash. Acad. Sci., vol. 13, Sept., 1923, p. 347.

Family CONGRIDAE

Genus CONGER Cuvier

CONGER WILSONI (Schneider).

Recorded from Honolulu by Fowler. A species described from Australia, unknown to recent writers.

Family MURAENIDAE

Genus GYMNOTHORAX Bloch

The genus *Gymnothorax* may ultimately prove to be divisible into several genera, perhaps, however, not wholly along the lines attempted by McClelland, Kaup, and others. Two species, *Muraena nudivomer* Günther, and *Gymnothorax xanthostomus* Snyder have no teeth on the roof of the mouth. These have been separated by Fowler from *Gymnothorax* proper, under the generic name of *Ahynnodontophis*, the type being *Gymnothorax stigmanotus* Fowler[5] from the West Indies.

GYMNOTHORAX HEPATICUS (Rüppell).

GYMNOTHORAX TILE (Buchanan-Hamilton).

These two Morays are recorded by Fowler from Honolulu.

Genus SIDEREA Kaup

(*Type.—Muraena sidera* Richardson=*Muraena picta* Ahl.)

SIDEREA PICTA (Ahl).

In this abundant species the vomerine teeth are very small, rounded, and arranged more or less in the form of a Y. For the group thus defined the name *Siderea* (later spelled *Sidera*) may be revived. Here belong, in addition to *picta*, other Hawaiian species, *Gymnothorax steindachneri* Jordan and Evermann, *G. hilonis* Jordan and Evermann and *G. nuttingi* Snyder.

Genus ECHIDNA Forster

(*Type.—Gymnothorax echidna* Schneider=*Muaraena nebulosa* Ahl and *Muraena variegata* Richardson).

The Morays with the teeth mostly bluntish, hitherto grouped under the name of *Echidna* Forster, constitute several fairly well marked groups; three of them occur in the waters of Hawaii.

The first is represented by the typical species of the genus *Echidna*, *E. nebulosa* (Ahl). In this, and in others belonging to the same group, there is a single row of conic but sharp canines in the front of the upper jaw, one or two rows of blunt lateral teeth above, two or three blunt canines on the anterior part of vomer, and a narrower band of molars in but one or two series running back along the

[5] Proc. Acad. Nat. Sci. Phila., vol. 64, p. 29. 1912.

middle line of the posterior portion of vomer, the remainder of the roof of the mouth being bare. The vertical fins are well developed, and the body is variously mottled rather than barred. In this section belongs also *Gymnothorax catenatus* Bloch, a West Indian form with similar dentition, the type of *Poecilophis* Kaup, a synonym of *Echidna*. For these species the name *Echidna* should of course be retained.

LEIHALA E. K. Jordan, new genus

(*Type.—Poecilophis tritor* Vaillant and Sauvage=*Echidna leihala* Jenkins.)

The second group of species, hitherto placed under *Echidna*, is distinguished by an extreme development of molars in the roof of the mouth. Lateral teeth and anterior canines similar to those of *Echidna nebulosa;* posterior part of the roof of the mouth, however, covered by a broad plaque of rounded, pebble-like teeth in 5 to 10 series; in youth somewhat fewer series are developed than in old age; however, even in very young specimens (typical *Echidna leihala* Jenkins) the whole width of the palate is covered by molars; anterior part of vomer supporting two or three conic but sharp canines, these apparently lost with age, in *L. tritor* at least; vertical fins well developed; body finely speckled, often more or less barred with black.

LEIHALA TRITOR (Vaillant and Sauvage).

Plate 1, figs. 1, 2

(*Echidna leihala* Jenkins.)

A fine specimen of this species, about 3 feet in length, and very much larger than any examined by Jenkins, was obtained in the Honolulu market. Teeth as in the genus, the lateral teeth above in but one series, the plate of vomerine teeth very large, in many (8 to 10) series. Ground color of body gray, finely flecked, speckled, dusted and reticulate all over with purplish brown; belly, back, head and fins all colored and shaded alike, no vestige of bars anywhere in life or after preservation in spirits. Angle of mouth slightly darker. In Jenkins's types of *Echidna leihala*, very much smaller, a few crossbars appear toward the base of the tail. Otherwise, his small specimens do not differ from our large one, nor apparently from *Poecilophis tritor*, also described from the Hawaiian Islands.

LEIHALA ZONATA (Fowler).

Certainly distinct from *L. tritor*, though similar in generic characteristics, the vomerine patch narrower, are the following alleged species, all described from Hawaii and all closely related: *Echidna zonata* Fowler (=*E. vincta* Jenkins), *E. psalion* Jenkins, *E. obscura* Jenkins, *E. zonophaea* Jordan and Evermann and *E. sauvagei*

Fowler.[6] Below are given the distinctive characters claimed for these species. The barred forms show large variation in the number and width of the dark cross bands, however, and the alleged differences in dentition should be verified. It has been suggested that all are variants of the East Indian *E. polyzona* Richardson, but the teeth in that species differ considerably from those of the Hawaiian forms.

In *E. psalion* Jenkins, the jaws close completely; the lateral teeth of the upper jaw are in but one series, and the dark cross bands are narrower than the interspaces.

In *E. obscura* Jenkins, the mouth nearly closes, the lateral teeth above are in two series, and the obscure dark bands are very much wider than the narrow interspaces.

In *E. zonata* Fowler (= *vincta* Jenkins), the mouth does not fully close; the lateral teeth above are in one series; and the sharply defined black bands are about as wide as the speckled or mottled pale interspaces.

In *E. zonophaea* Jordan and Evermann, the mouth does not close, the lateral teeth above are in a single series; and the dark bands are about as wide as the pale, much speckled interspaces. This form is close to *E. zonata* and is probably the same, but for the present we may accept all four, rather than exchange one doubtful opinion for another. The oldest name of all is *zonata* of Fowler, 1900.

In *E. sauvagei* Fowler, the jaws close completely, the lateral teeth above are in one outer series and three series within; vomerine plaque large, of three or four series; body with 24 dusky crossbands with diffuse edges, and about as broad as interspaces; angle of mouth black. This species seems midway between *L. tritor* and *L. zonata*.

In *E. polyzona* there are no canines in either jaw; the arrangement of the teeth is much the same as in the above species, but all are reduced to molars, and the teeth on the back of the vomer are fewer and somewhat separated. They are scattered across the whole width of the roof of the mouth, however. The lateral teeth above are in two series, and the dark brown crossbands are very much broader than the yellow interspaces. None of the Hawaiian morays seen by me can belong to this species although Fowler records it from Hawaii.[7]

Genus GYMNOMURAENA Lacépède

(*Type.—Gymnothorax zebra* Shaw, 1797.)

Another moray generally included in *Echidna*, but differing considerably from the others, was called *Gymnothorax zebra* by Shaw, and is the type of *Gymnomuraena* Lacépède as restricted by Kaup.

[6] Proc. Acad. Nat. Sci. Phila., vol. 64, p. 30. 1912.
[7] Idem.

It is characterized by the very slight development of the vertical fins, which are obscured by thick skin, and by the teeth, which are wholly molar, with no canines in either jaw. The lateral teeth are in several series in the upper jaw, and the whole roof and floor of the mouth are paved with small, rounded teeth in about 6 series above and 4 below, close set and suggesting cobblestones. In the upper jaw this paved area extends from the tip, where it is slightly expanded, back into the throat; below the arrangement is similar, but the patch forks narrowly behind. As stated above there are no canines, and the mouth is not wholly closing. For this group the name *Gymnomuraena* Lacépède must be restored. It originally included the genus *Uropterygius* also, but it was restricted by Kaup in 1846, to *zebra*.

Family BOTHIDAE

Genus PLATOPHRYS Swainson

PLATOPHRYS THOMPSONI Fowler.

Fowler describes this species from Honolulu as an ally of *Platophrys mancus* (Broussonnet). Its rays are D. 86, A. 62; scales 132; 95 tubes. In the abundant species, *Platophrys pantherinus* (Rüppell), the dorsal rays are 92; anal 69; tubes of scales 88; the color much the same.

Family BERYCIDAE

Genus BERYX Cuvier

BERYX DECADACTYLUS Cuvier and Valenciennes.

Recorded by Fowler from Honolulu.

Family HOLOCENTRIDAE

Genus MYRIPRISTIS Cuvier

The discrimination of species in *Myripristis* is very difficult, all of them being bright red in life, and all fading to a similar dull pinkish in spirits, with partial loss of their characteristic markings. The following key will assist in their recognition.

ANALYSIS OF THE HAWAIIAN SPECIES OF MYRIPRISTIS

a^1. Scales large, those bearing pores 30 to 32 in lateral line, a few small scales behind them; dorsal fin with 13 to 16 soft rays; anal with 13 or 14.

b^1. Edge of opercle and base of pectoral with a black or dark blood-red bar; depth 2.25 to 2.33 in length.

c^1. Body deep red in life; no broad black areas on vertical fins.

d^1. Spinous dorsal edged with orange; first soft ray of dorsal, anal and ventral white, the rays behind them clear red, tipped with blackish except in full-grown specimens---------- murdjan.

d^2. Spinous dorsal deep red throughout in life; no white rays on dorsal, anal, ventral nor caudal---------- **berndti.**

c^2. Body chiefly pale bluish or grayish in life; vertical fins each with a broad black area posteriorly---------- **adustus.**

b^2. Edge of opercle without black; axil faintly dusky; depth 2.75 in length. **argyromus.**

b^2. Scales smaller, 34 to 42 in lateral line, a few smaller ones behind not counted.

e^1. Dorsal fin with 14 to 15 soft rays; scales 34 to 37.

f^1. Edge of opercle and axil pale, without dark bar; soft dorsal 15; anal 13; scales 37; depth 2.5 in length; colors pale---- **sealei**

f^2. Edge of opercle and axil with a dark bar.

g^1. Fins all red in life; soft dorsal rays 15, anal 14; scales 36. **symmetricus.**

g^2. Fins mostly golden yellow in life, with red shades and edgings; soft dorsal 14; anal 12; scales 34-------**chryseres.**

a^2. Dorsal fin with 16 to 18 soft rays; anal rays 15; scales smaller than in other species, 40 to 43 with pores; edge of opercle and axil of pectoral dark red, becoming black; body and fins deep red, with faint stripes along the rows of scales; outer rays of soft fins white, some yellow shades on dorsal; size averaging smaller than other species. **multiradiatus.**

Of these species, the present collection includes *murdjan*, *berndti*, *symmetricus*, and *multiradiatus*, all of which are common at Honolulu. Of the last two I have nothing to add.

MYRIPRISTIS MURDJAN (Forskål).

This fish, known as U'u, is very abundant, constantly seen in the markets, and usually more common than all other species of *Myripristis* taken together. This is apparently the original *Sciaena murdjan* of Forskål, described from the Red Sea. Rüppell's figure,[8] drawn from a young example from the same region, shows the last rays of dorsal and anal, and the next to outer rays of caudal, very dark red or blackish. This coloration (var. *intermedius* Günther) is shown in the young of *murdjan*, but disappears entirely with age. In *M. murdjan* the developed scales of the lateral line, those bearing pores, are 29 to 32, the soft rays in the dorsal 14. In Rüppell's figure the number of scales represented is much too large, but Klunzinger counts correctly 30 in his material from the Red Sea.

MYRIPRISTIS BERNDTI Jordan and Evermann.

This is certainly a valid species, distinguished from *M. murdjan* by the color. The body is a shade paler than in *M. murdjan*, with paler shades or faint streaks along the margin of each row of scales. (In the figure given by Jordan and Evermann, the pale shades are incorrectly shown as lying along the middle of each scale row.) The dorsal fin in *M. berndti* is plain uniform red, the spinous part red throughout; the first soft ray of dorsal, anal, and caudal is deep

[8] Fische Roth, Meer., p. 86, pl. 23, to fig. 2.

red, never white; the black or blood-red bar on opercle and shoulder is present, but a little fainter than in *M. murdjan*, scarcely encroaching on the shoulder. After a time in spirits, these two species, easily separated in the field, can hardly be told apart, for the bright red on the fins fades to white, and can not be distinguished from what was originally white in life, or what was orange or yellow.

MYRIPRISTIS ADUSTUS Bleeker.

The Bishop Museum contains a fine cast of this well-marked species, made from a specimen taken in the Honolulu market. The body is pinkish or bluish, barely red; posterior part of dorsal, anal, and caudal are broadly black; spinous dorsal with two black stripes with white between; opercle and axil with a black bar; scales 30. This differs from *M. murdjan* mainly in color; the body is perhaps a little deeper. *Myripristis botche* Cuvier and Valenciennes, with the fins all pale, can not be this species, as Day has supposed. It is more likely to be *M. murdjan*.

Genus HOLOCENTRUS (Gronow) Scopoli

In our collections of this interesting genus from Honolulu, I find the identical species recorded by Jordan and Evermann, and in the study of their nomenclature I have reached identical conclusions. The key to the species given by Jordan and Evermann is, however, of little value, and those plates which are copied from Günther's Fische der Südsee (*micropterus*, *erythraeus*, and *punctatissimus*) are not very satisfactory. It is known that the key in question, as well as some others in the Fishes of Hawaii, was not prepared by either of the authors, but by an assistant called in in the press of executive work. The use of the size of the eye as a character to distinguish species is rarely of value. The genus *Flammeo*, based on *Holocentrus marianus* Cuvier and Valenciennes of the West Indies, is probably not tenable. The two species with large mouths found in Hawaii bear little resemblance to *H. marianus*. The subgenus *Sargocentron* Fowler, is better justified.

ANALYSIS OF THE HAWAIIAN SPECIES OF HOLOCENTRUS

*a*¹. *Sargocentron*. Body robust, the depth 2⅔ in length; entire body and fins deep brick red, the sides without pale stripes; faint shadings of yellow on the soft fins; dorsal spines low, subequal.

*b*¹. Opercular spines two, both strong; an area behind eye and in axil of pectoral deep red; back of caudal peduncle with a quadrate white blotch, disappearing with age; depth 2⅔ in length; size large; D XI, 16; A. IV, 11; scales 46 ..... spinifer.

*a*². *Holocentrus*. Body more elongate, the depth 2⅔ to 3 in length; sides more or less distinctly striped with white, yellow, or blackish; no white blotch behind dorsal.

*c*¹. Opercle with two spines, besides minor serrations.

d^1. Spinous dorsal with a large roundish black blotch on the first three spines; the remainder of fin rosy-silvery with a row of white spots at base; horizontal stripes on body dusky, consisting of rows of blackish spots, these actually aggregates of minute black punctations and not developed in the young, small specimens being faintly striped with silvery; no yellow on body anywhere; opercular spines small, subequal; preopercular spine short; anal spine strong; body more slender than in other species; mouth large, the maxillary reaching to below middle of eye__ **sammara.**

d^2. Spinous dorsal without distinct black blotch anteriorly on a fin otherwise pale; horizontal stripes on body white, silvery, or yellow.

e^1. Horizontal stripes along sides of the body white on a red ground; lower opercular spine not longer than upper.

f^1. Spinous dorsal uniform dark red; opercular spines sharp, the upper much the longer; body relatively slender; stripes on body sharply marked; no yellow in life_____ **xantherythrus.**

f^2. Spinous dorsal variously shaded or spotted, not uniform red; size small.

g^1. Spinous dorsal very dark red to black, with a curving or broken stripe of white along its middle; body relatively robust; upper opercular spine strong, longer than lower; stripes strongly marked_____ **diadema.**

g^2. Spinous dorsal not as above; opercular spines short, subequal.

h^1. Dorsal fin low, the spines subequal, and the profile of the fin little convex, the fin red, with a row of pale spots along the membranes mesially; stripes on body not sharply defined; mouth rather large_____ **erythraeus.**

h^2. Dorsal fin higher, its outline more convex; dorsal margined above with blood red, this color becoming black in spirits; body pale, the white stripes rather conspicuous; mouth small; preopercular spine short; opercular spines small.

i^1. Body not dusted over with blackish dots; snout rather pointed; dorsal with a broad pale median shade, the base darker; anal spine strong, longer than the soft rays _____ **microstomus.**

i^2. Body usually largely dusted over with fine dark specks or punctulations; opercular spines insignificant; anal spine slender, sometimes shorter than the soft rays, sometimes longer (*gracilispinis* Fowler); smallest of the Hawaiian species_____ **punctatissimus.**

e^2. Horizontal stripes on body bright golden yellow; lower opercular spine longer than upper, both sharp; body rather slender; mouth large, the maxillary reaching to opposite middle of eye; anal spine strong; spinous dorsal golden red, the membranes of the first two spines blood-red; axil of pectoral pale. **scythrops.**

c^2. Opercle with a single strong spine; color bright red; the horizontal stripes golden (becoming white in spirits); spinous dorsal low, even, yellowish red; soft fins with pale borders; axil of pectoral dark red; preopercular spine moderate; anal spine rather short and slender; body rather deep; mouth large, the maxillary reaching to below the middle of the eye; eye large_____ **ensifer.**

Family EXOCOETIDAE

Genus CYPSELURUS Swainson

CYPSELURUS SPILOPTERUS (Cuvier and Valenciennes).

Recorded by Fowler from Honolulu.

Notwithstanding their abundance, swarming everywhere in the open seas about Honolulu, no flying fishes were brought into the market during my stay. Fishermen said that it did not pay to go after them.

Family CENTRISCIDAE

Genus AEOLISCUS Jordan and Starks

AEOLISCUS STRIGATUS (Günther).

Recorded as *Centriscus strigatus* by Fowler.

Family SYNGNATHIDAE

Genus CORYTHOICHTHYS Kaup

CORYTHOICHTHYS MATAAFAE Jordan and Seale.

Of this Samoan species, two specimens were obtained by Fowler from Waikiki Beach.

Family GADIDAE

Genus PHYSICULUS Kaup

PHYSICULUS GRINNELLI Jordan and Jordan.

This is probably the species recorded as *Physiculus kaupi* Poey by Fowler. That species from Cuba has the dorsal rays 10–60, the anal 60 (D. 73 in *grinnelli;* A. 65). The species of this genus, scantily distributed at moderate depths through the warmer parts of both oceans—*dalwigki*, *kaupi*, *japonicus*, and *grinnelli*—are extremely similar one to another. Others in deeper waters are better defined, *fulvus* having much larger scales, *nematopus* produced ventrals and *rastrelliger* numerous (7+18) gill rakers, these structures being few, short and small in all the others.

II

Family SCOMBRIDAE

Genus NESOGRAMMUS Evermann and Seale

NESOGRAMMUS THOMPSONI Fowler.

This interesting fish, represented by a fine cast in the Bishop Museum, is described by Fowler.[9]

[9] Proc. Acad. Nat. Sci. Phila., vol. 64, p. 376.

Family THUNNIDAE

Genus THUNNUS South

THUNNUS THYNNUS (Linnaeus), Ahi.

This great Tunny or Tuna of Hawaii and Japan, possibly distinct from *Thunnus thynnus* of the Atlantic, grows to a very large size, one individual having been seen weighing 580 pounds; unfortunately fins and finlets had been removed. As in the young of the Tunny, immature individuals of 3 feet in length or less have the sides marked by narrow cross-streaks of dull silver, broken up below into whitish spots.

Pectorals reaching two-thirds distance to anal and falling an inch short of soft dorsal, 1½ in head, not edged with darker; dorsal lobe 2⅛ in head, its edge as well as that of anal darker; finlets 7/7, dull yellow, clearly edged with black.

In Japanese specimens, called *Thunnus orientalis*, Doctor Jordan found the dorsal finlets bluish, the anal dull yellowish, the finlets 8/9, gill rakers below 13, dorsal spines XIII to XV. Steindachner's *Orcynus schlegeli* is the young of the species.

The only distinction apparent between *Thunnus orientalis* and *Thunnus thynnus* seems to lie in the color of the finlets, which, in *T. thynnus*, are dark bluish, colored like the back. Perhaps they grow darker with age.

The European Tunny (*thynnus*) has the finlets 8 or 9 above, 7 or 8 below.

Genus GERMO Jordan

GERMO ALALUNGA (Gmelin).

(*Scomber germo* Lacépède; *Thynnus pacificus* Cuvier and Valenciennes.)

The common Albacore has the finlets bluish, without trace of yellow. It was not observed by me, but is recorded as seen by Jordan and Jordan in 1921.

Germo argentivittatus (Cuvier and Valenciennes), mentioned by Jordan and Jordan, should be dropped from the list. The specimen noted by Mr. Nichols was obtained by Dr. Evermann in Peru.

Genus PARATHUNNUS Kishinouye

PARATHUNNUS SIBI (Schlegel).

(*Parathunnus mebachi* Kishinouye.)

This species much resembles *Neothunnus macropterus*, but the dorsal finlets, yellow in the center, are broadly margined with black with a narrow edge of white; the long posterior tip is black. The anal finlets are not yellow, but blackish with a whitish edge, the center sometimes faintly yellow-shaded. Dorsal and anal lobes mod-

erate, 2½ in head. Pectoral long, reaching second dorsal finlet; preorbital narrower than in *Neothunnus macropterus*. Finlets 9/8.

This fish is apparently identical with the Shibi or Mebachi (wasp-eye) of Japan. It is common in the markets both of Hawaii and Japan. These large fishes are rarely obtained by native Hawaiian fishermen, but are secured in great numbers by the adventurous Japanese, who go far out to sea, and who now monopolize the island fishing.

Genus NEOTHUNNUS Kishinouye

NEOTHUNNUS MACROPTERUS (Schlegel), Ahi.

The yellow finned Albacore is abundant in deep water about Hawaii; common also in Southern Japan and about the Santa Barbara Islands of California.

This species is known at once by its bright lemon yellow finlets colored alike above and below, each one anteriorly edged with a narrow line of black; pectoral edged with black, a little longer than head and reaching almost to the second anal finlet; dorsal very high, 1 $\frac{9}{10}$ in head, the lobes of dorsal and anal dull yellow, edged with black; finlets 8/9. Preorbital broad. No crosslines of spots on body; some elongate spots of dull silvery sometimes present.

Genus KATSUWONUS Kishinouye

KASUWONUS PELAMYS (Linnaeus), Aku.

This species, the Aku or Oceanic Bonito, is the most abundant of the large fishes in the Honolulu markets. It runs in great schools in the open sea, where it probably spawns. Young fishes of this, or other Tunnies and Albacores are almost never seen about Honolulu, and they probably cast their spawn in the open sea. I have a report apparently authentic, of a school of Aku, 96 miles long, once passing Hawaii.

The flesh of the Aku is coarse and very red. About one fourth the catch is used as bait for larger and better species; much of the rest is canned as Tuna.

Genus EUTHYNNUS Lütken

EUTHYNNUS ALLETERATUS (Rafinesque).

This species, the Kawakawa of the markets, is a shore fish breeding in the shallow waters of Hilo Bay, which is lined with lava sand, not with coral.

Family ACANTHOCYBIIDAE

Genus ACANTHOCYBIUM Gill

ACANTHOCYBIUM SOLANDRI Cuvier and Valenciennes.

This huge mackerel, called Ono, which reaches a length of 6 to 8 feet, is now common in the markets of Honolulu, being brought in

by the open-sea fishermen. Its flesh is white and excellent. The peculiar network structure of the gills, like that of the sword-fish (*Xiphias*), the laminae of each arch joined into one plate by reticulations, probably justifies the recognition of this genus as type of a distinct family. The same structure of the gills occurs in *Istiophorus* and *Tetrapturus*.

Family GEMPYLIDAE

Genus RUVETTUS Cocco

RUVETTUS TYDEMANI (Weber).

Ruvettus pretiosus JORDAN and EVERMANN (not of Cocco, Osservationes Peloritani, vol. 13, p. 18, 1833.)

Ruvettus tydemani WEBER, Fische *Siboga* Exped., p. 401, 1913.

Ruvettus pacificus JORDAN and JORDAN, Memoirs of Carnegie Museum, vol. 10, no. 1, 1922, p. 34.

This rare species, the Walu of the fisherman, was first described as distinct from the Atlantic species, *R. pretiosus*, by Weber in 1913. The name *tydemani* has priority over our designation of *R. pacificus*.

Family ISTIOPHORIDAE

Genus TETRAPTURUS Rafinesque

TETRAPTURUS MITSUKURII Jordan and Snyder, A'u.

The spear-fish or marlin-fish, known as A'u, seems to be the same as the Japanese species *T. mitsukurii*, and also identical with the form found in Southern California and in New Zealand, no differences appearing in photographs. It needs comparison with *Tetrapturus audax*[10] (Philippi) from Chile, as well as with the Mediterranean species, *Tetrapturus belone* Rafinesque. Both names, *belone* and *audax*, have priority over *mitsukurii*. The still earlier name *imperator* of Schneider, was based on a bad drawing of the sword-fish, *Xiphias*. According to Lütken all the species of *Tetrapturus* are reducible to two, *Tetrapturus belone* of the Atlantic and *T. herscheli* of the Pacific, the latter described from the Cape of Good Hope (1838). A still earlier Pacific name is that of *Tetrapturus indicus* (Cuvier and Valenciennes, 1831), from a drawing made in Sumatra. Probably our species will ultimately stand as *Tetrapturus indicus*, but as there is little gain in substituting one doubtful opinion for another, we may provisionally retain the name *Tetrapturus mitsukurii* for the species of the North Pacific.

Genus CARANX Lacépède

Teeth unequal, some of them enlarged; lateral line strongly arched in front.

[10] *Histiphorus audax* Philippi, Anales de la Universidad de Chile, vol. 81, p. 35, 1887, pl. 8, Iquique, Chile. Color dark, with whitish cross streaks as in *T. mitsukurii*.

CARANX MELAMPYGUS Cuvier and Valenciennes, Ulua.

This species is the common Ulua, one of the most valued food fishes throughout the South Seas.

It may be distinguished from near relatives by its soft dorsal of 25 soft rays, the anal of 19, and by the completely scaled breast, a character shown also by *Caranx stellatus*, the common and almost equally valued Omilu. In *Caranx melampygus* the pectorals are bright clear yellow in life, the ventrals white, the anal and dorsal pale at base, their produced tips black, the distal portion of the anal especially so, and there are never any black spots or blotches on the body. The longest dorsal ray is a little more than half base of the soft fin, and about the same in depth of body. According to Doctor Wakiya[11] *Caranx bixanthopterus* Rüppell, from Southern Japan differs from *Caranx melampygus* in having the lobe of the soft dorsal 2⅙ in the base of the fin. *Caranx bixanthopterus*, as thus defined, has not been found in Hawaii. This species was wrongly called *Caranx forsteri* in Jordan and Evermann's Fishes of Hawaii (p. 191).

CARANX STELLATUS Quoy and Gaimard.

(*Caranx melampygus* Günther and Jordan and Evermann, not of Cuvier and Valenciennes.)

The Omilu, one of the largest members of this genus and a valued food-fish, is closely related to the Ulua. It may be known at all ages by the dusky ventral fins and the presence of small scattered black spots over the body. The young are silvery, like the Ulua, but with age the color becomes dusky, and the irregular black spots more numerous and larger. In the young, the pectorals are pale, with a median yellow stripe, becoming dusky with age. The dorsal, anal, and ventrals are entirely black in the adult. Dorsal lobe about as in the Ulua, 1¼ in head in adult, 1⅕ in young.

CARANX MARGINATUS Gill.

This species, not rare at Honolulu, much resembles *Caranx melampygus*, but the soft rays of the anal number 16 instead of 19, and the dorsal rays are 22. The soft dorsal is throughout broadly edged with black, the anal pale, with a row of darker spots at base, along the tips of the interhaemals; caudal edged with dark; ventrals and pectorals pale; a black spot in the axil; a small black opercular spot.

In the account of *Caranx marginatus* of Jordan and Evermann,[12] from Panama, the soft rays of the dorsal are given as 19, the anal 15. The usual numbers, as recorded by Gilbert and Starks, run higher (D. 20 or 21; anal 16 or 17), agreeing in this regard with

[11] Ann. Carnegie Mus., vol. 15, p. 191, 1924.
[12] Fish. North Mid. Amer., vol. 1, p. 922, 1896.

the Hawaiian fish (D. 22, A. 16). The anal in the American fish is golden yellow in life.

CARANX IGNOBILIS (Forskål).

This common species, the Pau'u'u, is known from other Hawaiian forms of *Caranx* by the naked breast with a small patch of scales in the center as in its Atlantic analogue, *Caranx hippos* (Linnaeus). In the life the pectoral and ventral fins are pale, both dorsals and caudal edged with blackish, the anal and lower lobe of caudal bright yellow, no black spot on lower rays of pectoral.

This fish is very close to *Caranx hippos*, but in that species the adult always has a black blotch on the lower part of the pectoral.

CARANX XANTHOPYGUS Cuvier and Valenciennes.

Doctor Wakiya regards *Caranx rhabdotus* Jenkins as identical with *Caranx xanthopygus* which is not unlikely. He regards *Caranx sexfasciatus* Quoy and Gaimard as a distinct species identical with *Caranx flavocoeruleus* Schlegel of Japan.

CARANX KUHLII Bleeker.

To the list from Hawaii, Mr. Fowler adds *Caranx kuhlii* Bleeker, an ally of *Caranx marginatus*.

CARANX LUGUBRIS Poey.

Fowler adds this West Indian species also to the fauna of Hawaii. The body and fins, the pectoral excepted, are sooty black. The fish was obtained from the Clarion Island, but the Pacific form needs farther comparison with the types from Cuba.

Genus URASPIS Bleeker

Teeth in the jaws in a single series, none on vomer or palatines, spines on scutes directed forward.

URASPIS HELVOLA (Forster).

This species is referred to by Wakiya to the genus *Uraspis*.

URASPIS CHEILIO (Snyder).

This species, notable for its thick lips, reaches a length of 3 feet or more. It was three times seen in the market, but owing to its large size only the head of one example was taken away. Only the type, 30 inches long, was previously known.

Genus CARANGOIDES Bleeker

Teeth small, even, persistent; lateral line little arched anteriorly; breast naked.

CARANGOIDES JORDANI Nichols.

(*Carangoides ferdau* Jordan and Evermann, not *Scomber ferdau* Forskål.)

This species, the Ulua Omilu of fishermen is an important food fish of Honolulu, reaching a considerable size. It is distinguished

from *Carangoides ferdau* by the numbers of rays (D. 20; A. 16, instead of D. 23, A. 19) and by its dusky colors, the sides always with a few rather large irregular bronze spots; pectorals pale, other fins mostly dusky. The species needs comparison with others of the same genus found in the East Indies.

CARANGOIDES DASSON (Jordan and Evermann).

This species, with the teeth all villiform, should be placed in *Carangoides* (not *Caranx*).

Genus HYNNIS Cuvier

HYNNIS AJAX (Snyder).

The very large fish, described by Snyder as *Carangoides ajax* and figured by Jordan and Evermann, belongs to the group called *Hynnis* Cuvier and Valenciennes, which differs from the earlier genus *Scyris* Cuvier only in the lack of filiform rays in the second dorsal, perhaps a matter of age. *Hynnis ajax* is close to *Hynnis hopkinsi* Jordan and Starks, from Mazatlan, differing mainly in the rather more slender form. A single example 3 feet long was seen in the Honolulu market, but not taken. It would be interesting to know the changes with age in this species. Except for the much more elongate form of the body and the lack of produced rays in the known examples, *Hynnis* scarcely differs from *Alectis*. But the type specimens of each of the known species of *Hynnis* (*goreensis*, the type of the genus, *cubensis*, *hopkinsi*, and *ajax*) were 2 to 3 feet in length. In none is there any trace of spinous dorsal, or of filaments on the fins.

But the filaments disappear in very old examples of *Alectis ciliaris*, as sometimes seen in the market of Honolulu, one such having been sent by us to the American Museum. *Alectis* has, however, the body much deeper, at all ages, than in *Hynnis* (2¾ to 3 in *Hynnis*, 1⅕ to 2 in *Alectis*, 2⅖ in the type of *Scyris*).

To avoid changing a doubtful opinion for another, I retain the name *Hynnis* for this genus though it may eventually be merged in *Scyris*, or both in *Alectis*.

In Fowler's supplementary list he records "*Scyris indica* Rüppell" which corresponds to the form just mentioned as the probable adult of *Alectis ciliaris*, the depth 2 in length. *Hynnis ajax* has the depth about 3 in length, and no black spot on the upper angle of the opercle, a trait which appears in all or nearly all the fishes referred to *Alectis* and *Scyris*.

Hynnis may be characterized as follows: Head naked; body rather elongate, the depth about one-third length, naked except for an area along lateral line with smooth imbedded scales; profile of head convex; mouth moderate, with villiform teeth on jaws, vomer,

palatines and tongue, dorsal and anal little elevated in front, without filamentous rays so far as known; the dorsal with 18 or 19 soft rays, the anal with 15 or 16. Scutes few and weak, spinous dorsal disappearing with age; lateral line strongly arched.

Genus TRACHUROPS Gill

TRACHUROPS MAURITIANA (Quoy and Galmard).

(*Trachurops crumenophthalmus* Jordan and Evermann.)

In Wakiya's subdivision of (*Trachurops* Gill) the common Hawaiian Akule is referable to *Selar mauritianus*. The earliest restriction of *Selar* Bleeker to *Caranx boops* Bleeker can not hold, as *boops* is not one of the species originally named by Bleeker, under *Selar*. The proper type is *Caranx hasselti=Caranx affinis*, and the name *Selar* must replace *Atule* Jordan and Jordan.

Genus SCOMBEROIDES Lacépède

SCOMBEROIDES TOLOOPARAH (Rüppell).

The common Lae of the Hawaiian markets corresponds to *Scomberoides moadetta* Ehrenberg, 1831, in Wakiya's classification. But *S. tolooparah* of Rüppell (1828), described also from the Red Sea, seems to be the same fish, as indicated by Jordan and Evermann. The more slender form, called *Scomberoides sancti-petri*, was not seen by us.

Family BRAMIDAE

Genus TARACTES Lowe

TARACTES STEINDACHNERI (Döderlein).

Recorded by Fowler.

Family NOMEIDAE

Genus CUBICEPS Lowe

(*Ariomma* Jordan and Snyder.)

The genus *Ariomma* differs from *Cubiceps*, if at all, in the rather larger scales, 55 in A. *lurida*, 60 to 66 in *Cubiceps*.

Fowler describes another species of these fragile fishes as *Cubiceps thompsoni*. It differs from *Cubiceps luridus* in having 14 rays in the soft dorsal instead of 17. *Cubiceps evermanni* Jordan and Snyder, also from Hawaii, has a blunter head and larger scales than either of the others.

Family SERRANIDAE

Genus STEREOLEPOIDES Fowler

STEREOLEPOIDES THOMPSONI Fowler.

A huge "jewfish," 6 or 7 feet in length, described as new by Fowler.

Genus EPINEPHELUS Bloch

EPINEPHELUS SEPTEMFASCIATUS Thumberg.

This Japanese species is added by Fowler. Hitherto but one species of this widespread genus, *E. quernus*, has been noted in Hawaii.

Genus CAESIOPERCA Günther

CAESIOPERCA THOMPSONI Fowler.

An interesting new species described by Fowler.

Genus ODONTANTHIAS Bleeker

ODONTANTHIAS ELIZABETHAE Fowler.

Another bright colored fish described by Fowler.

Genus CAPRODON Schlegel

CAPRODON SCHLEGELI Günther.

Omitted by inadvertance in the record of Jordan and Jordan. Described, with a colored plate, by Jordan and Snyder[13], from a specimen from Honolulu, the only one known from the Hawaiian Islands. According to Tanaka, this specimen and the one described earlier by Jordan and Richardson from Japan, belong to a species distinct from *C. schlegeli*, which he names *Caprodon affinis*.[14] *C. affinis* is figured as having the body a little more elongate, and the blackish blotches along the back extending, with interruptions, along the whole base of the dorsal, while in *C. schlegeli* they are confined to the posterior part of the spinous dorsal. On the Hawaiian specimen, figured by Jordan and Snyder, there is no black either on the dorsal fin or on the back. This color probably disappears with age, and *Caprodon affinis* would seem to be the young of *Caprodon schlegeli.*

CAPRODON LONGIMANUS Günther.

This species is recorded by Fowler.

Family PRIACANTHIDAE

Genus PRIACANTHUS Cuvier

PRIACANTHUS JAPONICUS Cuvier and Valenciennes.

Two specimens of this large and handsome fish were secured. This is with little doubt the form recorded by Fowler as *P. boops* Schneider, following Boulenger, who unites all the large *Priacanthi* of both oceans under this name. *P. boops* was originally described from the South Atlantic; it has about 95 scales in longitudinal series, about 60 along lateral line and only 12–13 dorsal and anal

[13] Bull. U. S. Bur. Fish., vol. 20, p. 211, 1906.
[14] Fig. and Desc. Fishes Japan, vol. 33, Aug. 24, 1924, p. 611, pl. 158, fig. 408.

rays. *P. japonicus* is related, but has fewer scales (about 80, lateral line 40–45), and more fin rays. Our specimens agree well with an example of this species from Japan. Color bright red all over, the tips of the fins black; ventral fins very long; body deep, 2½ or less in length; Length 2 feet, a much handsomer and more powerful looking fish, with larger scales, than others of the genus.

Family APHAREIDAE

Genus APHAREUS Cuvier and Valenciennes

APHAREUS THOMPSONI Fowler.

Described as new from a specimen obtained in the Honolulu fish market by John W. Thompson, the artist of the Bishop Museum. It has gill rakers 18+24, while *A. furcatus* Cuvier and Valenciennes has but 6+16. In the nominal species, *Aphareus flavivultus* Jenkins, there are 5+15.

III

Family HISTIOPTERIDAE

Genus HISTIOPTERUS Schlegel

HISTIOPTERUS TYPUS Bleeker.

Fowler records a specimen from Hilo, perhaps the one of which the cast was noted by Jordan and Jordan.

Family SCORPAENIDAE

Genus MERINTHE Snyder

MERINTHE MACROCEPHALA (Sauvage).

In this species we find a surprising variation in the development of the orbital cirrus. In some especially large examples this appendage is long, worm-like, more than half the length of head. In others it is variously shorter, about as long as eye, as in the figure given by Jordan and Evermann (p. 461, pl. 55). In still others, it is reduced to a small black filament much shorter than pupil, and in some small individuals it is not traceable at all. Those with the shorter filaments are smaller in size, presumably younger. No other difference can be found on the specimens.

This species, taken from deeper water with *Etelis*, *Etelinus*, and other red fishes, is in life bright scarlet, with dark olive or blackish dots and markings. It is remarkable for the great length of the head which is nearly, not quite, as long as the rest of the body.

Genus IRACUNDUS Jordan and Evermann

IRACUNDUS SIGNIFER Jordan and Evermann.

A third specimen of this rare species is recorded by Fowler.

Genus TAENIANOTUS Lacépède

TAENIANOTUS TRIACANTHUS Lacépède.

Recorded by Fowler.

Family DACTYLOPTERIDAE

Genus DACTYLOPTENA Jordan and Richardson

DACTYLOPTENA ORIENTALIS (Cuvier and Valenciennes).

I can detect no difference between our specimens of this species from Honolulu and others from Japan.

Family ZEIDAE

Genus ZENOPSIS Gill

ZENOPSIS OCELLATUS (Schlegel).

Fowler records this Japanese species.

Family CHAETODONTIDAE

Genus CHAETODON Linnaeus

CHAETODON SEMEION Bleeker.

A fine cast of this showy species is in the Bishop Museum.

CHAETODON RETICULATUS Cuvier and Valenciennes.

A cast of this handsome species, known by the bright red color of the posterior part of the anal, is in the Bishop Museum. This is the species recorded by Fowler as *Chaetodon collaris*, as it is the *Chaetodon collaris* of Günther, but not of Bloch nor of Schlegel. Bloch's species, recorded, doubtfully, from Japan, is probably *Chaetodon praetextatus* of Cuvier and Valenciennes, of the East Indies. The species called *Chaetodon collaris* in Japan is different from either and should stand as *Chaetodon auripes* Jordan and Snyder, the earlier name *aureus* being preoccupied in *Chaetodon*.

CHAETODON LINEOLATUS Cuvier and Valenciennes.

In Günther's figure (Fische der Südsee), copied from Garrett, the narrow crosslines like pencil marks in this species are represented as very oblique, directed forward below. Actually, however, as stated in various descriptions, these lines descend almost vertically.

CHAETODON FREMBLYI Bennett.

This species, notable for its blue markings and for the absence of the orbital bar, I found fairly common at Honolulu, only the small *Chaetodon miliaris* exceeding it in abundance.

Genus TIFIA Jordan and Jordan

TIFIA CORALLICOLA (Snyder).

Several specimens of this rare species were obtained from the reef.

Genus HEMITAURICHTHYS Bleeker

HEMITAURICHTHYS POLYLEPIS Bleeker.

Recorded by Fowler.[15]

HEMITAURICHTHYS THOMPSONI Fowler.

Described as new by Fowler.

Genus CHAETODONOPLUS Bleeker

CHAETODONTOPLUS ARCUATUS (Gray).

A specimen, the second known, recorded by Fowler.

Genus CENTROPYGE Kaup

CENTROPYGE FLAVISSIMUS (Cuvier).

A specimen of this brilliantly yellow fish of the South Seas recorded by Fowler. Body and fins entirely yellow, except for blue edgings and lines. A small example supposed to be of this species was seen in 1921 in the aquarium at Waikiki.

Family ACANTHURIDAE

Genus ACANTHURUS Forskål

(*Hepatus* Gronow; *Teuthis* Linnaeus in part, not as usually restricted.)

ACANTHURUS NIGRICANS (Linnaeus).

Recorded by Fowler.

ACANTHURUS THOMPSONI Fowler.

Described by Fowler.[15] A species everywhere almost black, with a jet black blotch in its axil below.

Family LABRIDAE

Genus DIASTODON Bowdich

(*Type.—Diastodon speciosus* Bowdich=*Labrus scrofa* Cuvier and Valenciennes.)

DIASTODON MODESTUS Garrett.

This species, reported by Fowler, we have never seen. The figure by Garrett[16] shows small scales (about 53) and a large white blotch below last rays of dorsal. The species can not therefore be referred to *Lepidaplois*, in which genus the scales are about 33. It seems to accord generically with the type of *Diastodon*.

Genus LEPIDAPLOIS Gill

(*Gymnopropoma* Gill.)

The fact that in the type of *Lepidaplois* (*axillaris*) the scales cover most of the preopercle, while in *bilunulatus* (type of *Gymno-*

[15] Proc. Acad. Nat. Sci. Phila., vol. 64, p. 384. 1912.

[16] Fische der Südsee; copied in Jordan and Evermann, Fishes of Hawaii, p. 279.

propoma) the two limbs of the preopercle are almost scaleless, hardly justifies the separation of the group into two genera.

LEPIDAPOLIS ATRORUBENS E. K. Jordan, new species.

Plate 1, fig. 3

Head 3.1 in length; depth 3; snout 2.9 in head; eye 6.7; interorbital 3.4; D. XII, 11; A. III, 12; scales 7–34–13.

Body oblong, stout, not greatly compressed; head longer than deep, upper and lower profiles only weakly convex, almost similar; snout rather long, pointed; jaws pointed, about equal; mouth large; teeth strong, conic; 4 large canines on front of each jaw, and a strong posterior canine tooth; lips fleshy; eye rather large, its posterior margin slightly anterior to middle of length of head; posterior margin of preopercle very finely serrate; interorbital fairly broad, convex; nostrils in front of eye, the anterior smaller, and in a very short fleshy tube; last dorsal spine 4.8 in head; seventh dorsal ray 2.8; third anal spine 4; caudal deeply lunate, the outer rays produced and about one and two-thirds length of the inner, their total length about 1.3 in head; base of caudal broad, about 2 in head; pectoral rather small, about 1.7 in head; ventrals long, pointed, the first few rays greatly produced, their length about 1.2 in head; scales large, thin, flexible, small upon back in front of dorsal fin and along base of dorsal and anal; scales smaller on chest than on rest of body; no scales in front of eye, the interorbital wholly bare, part of head posterior to middle of eye otherwise largely covered with small scales; lateral line nearly concurrent with dorsal profile, uninterrupted, the pores distinct and rather complexly branched.

Color in life somewhat variable. One specimen, the type, had the body a deep wine red, irregularly blotched with very dark brown, approaching black, more dark dorsally than on belly, these blotches arranged in no regular pattern and not corresponding on the opposite sides of the fish; upper part of the body faintly striped longitudinally with lighter and darker, these stripes corresponding to the rows of scales and much more prominent on the darker areas, being formed by a longitudinally oblong light patch on the center of each scale; head reddish brown, lighter and more red in places, darker and browner in others, two diffuse longitudinal streaks running back from eye to edge of opercle, the upper meeting end of lateral line, the chin practically black, with irregular dark red spots; dorsal almost wholly dark or nearly black, a very black spot between the second and third spines; a large, vague black blotch below last rays of dorsal, anal very dark, margined with black; pectoral brown, darker near the base, the axil of pectoral orange; ventrals and caudal black.

Another specimen was dull grayish brown all over in life, the body obscurely longitudinally striped, but generally uniform in color and not heavily blotched with dark, a large vague black patch on back under last rays of dorsal similar to that on *L. albotaeniatus* but more diffuse; head without longitudinal streaks running back from eye; the cheek, and most of opercle dark; chin yellowish brown, darker in places; fins dark brown, but not black, a very prominent black spot between second and third dorsal spines; pectorals lighter in color than other fins, the axil dark rusty red.

Another specimen is in general similar to the above, but the dark blotch under the last rays of dorsal is less evident; black spot between the second and third dorsal spines conspicuous; axil of pectoral rusty.

In spirits the appearance is not greatly altered. The deep red fades more or less, however, becoming a light yellowish brown, with pinkish stains, and the fish becomes generally lighter in color. This species differs from *Diastodon modestus*, which it otherwise somewhat resembles, in the number of scales, 34 in this fish as against 53 in the other. In *D. modestus* a large whitish spot is figured below last rays of dorsal.

Three specimens were taken in the Honolulu market. The type 14½ inches long is Cat. No. 87421, U.S.N.M.; cotypes, 15½ and 17 inches long, are in the collection of Stanford University.

Genus CORIS Lacépède

If this genus is to be further subdivided, the prolongation of the first dorsal spine will perhaps serve better than the size of the scales. The type of *Coris* (*aygula*) has the anterior dorsal spines elevated; no posterior canines; scales 61. In the type of *Julis* (*julis*), the first spines are elevated, a posterior canine is present, and the scales are 75. In the type of *Hemicoris* (*variegata*) the first dorsal spine is lower than the others, a posterior canine is present, and the scales are 52. For the present we may refer all the Hawaiian forms to *Coris*. None of the Hawaiian species has posterior canines. In *gaimardi* (scales 84) the front of the dorsal is elevated; also in *lepomis* (scales 92), *ballieui* (scales 52), and *rosea* (scales 53). The first spine is lowest in *eydouxi* (scales 81), in *flavovittata* (scales 88), and in *greenovii* (scales 78).

CORIS GAIMARDI (Quoy and Gaimard).

(*Coris pulcherrima* Günther.)

Our specimens of this highly colored reef fish are apparently referable to *Coris pulcherrima*. The species is extremely variable and the bands on the head appear to be green, crimson, or violet under different lights. They also vary much in width. Different observers (Günther, Jenkins, Jordan and Evermann) have tried

to show differences between the common form (*pulcherrima*) and the longer known *gaimardi*, but without much success. I believe the two to be identical. Günther mentions a posterior canine in *C. gaimardi*, but I fail to find it.

CORIS VARIEGATA (Rüppell).

This strongly marked species is recorded by Fowler.

CORIS, species indetermined.

In the aquarium at Waikiki I saw a living species of *Coris*, apparently undescribed. The following are its life colors:

Back with obscure broken greenish longitudinal stripes, below lateral line these become rows of quadrate vertical spots much deeper than long; top of head marbled, the sides of head with about three rows of darker blotches on the side; dorsal and anal blue-edged; caudal clouded at base, then black, becoming paler at tip; ear spot blue, rimmed with black. A large fish, looking like *C. lepomis* and with the ear spot as in *C. eydouxii* (blue-black in color), but apparently different from either. The first dorsal spine is elevated.

Genus ANAMPSES Cuvier

ANAMPSES GODEFFROYI Günther.

There can be no doubt that the painting of Garrett, on which the name *godeffroyi* rests, was intended for the fish later called *Anampses evermanni* by Jenkins. Garrett's painting was hastily made, but could represent nothing else.

Family POMACENTRIDAE

Genus CHROMIS Cuvier

CHROMIS SINDONIS Jordan and Evermann.

This fish, not obtained by me, cannot be placed in *Abudefduf*, and is near *Chromis*, from which genus it differs only in having a deeper body than others.

CHRONIS VERATER Jordan and Thompson.

Two specimens of this rare species taken.

IV

Family SCARIDAE

Genus LEPTOSCARUS Swainson

(*Calotomus* Gilbert: *Callyodon* Cuvier and Valenciennes, but not of Gronow, nor of Scopoli, nor of Schneider, the type of these authors being *Scarus croicensis* Bloch, of the West Indies.)

The name *Leptoscarus*, given by Swainson to *Scarus vaigiensis* of Quoy and Gaimard, a near ally of *Leptoscarus irradians*, is the oldest

applicable to the species of this genus. The name *Sparisoma*, for *Scarus abbildgaardi* must apparently be retained for a related genus, although the definitions assigned by Swainson to his various genera of *Scari* are mostly without pertinence.

ANALYSIS OF HAWAIIAN SPECIES OF LEPTOSCARUS

a^1. Color of body and fins dull grayish or brownish.
  b^1. Dorsal fin with a small black spot between first and second spines; caudal somewhat lunate.
    c^1. Sides above lateral line with a series of about five roundish white spots as large as pupil; dorsal also with small whitish markings; sides of body below lateral line with about 10 or 12 large round spots; numerous smaller spots and irregular markings scattered among these ---------- snyderi.
    c^2. Sides somewhat mottled with lighter but without distinct spots or specks; dorsal obscurely marked with darker, not distinctly spotted with white ---------- sandvicensis.
  b^2. Dorsal fin without black blotch in front; caudal rounded ---- cyclurus.
a^2. Color of body and fins chiefly blue or green; about 8 pale or pink stripes radiating from eye; scales each with a pink spot at base; fins mottled or striped; caudal truncate ---------- irradians.

LEPTOSCARUS IRRADIANS (Jenkins).

This handsome species is common about Honolulu. Günther[17] is apparently in error in identifying it with *Leptoscarus genistriatus* (Bleeker) of the East Indies. In life, *irradians* is blue and green, the markings on the head pink, while *genistriatus* is a dark red fish much mottled with darker; the head markings figured as a deep red. Except for the general color the patterns on the two are quite similar.

Genus SCARIDEA Jenkins

This genus, with *Sparisoma*, differs from all other Hawaiian *Scaridae* in having stiff dorsal spines. From *Sparisoma* it is distinguished by the few series of nearly free teeth—at most three in either jaw and not coalescent except at the base. The teeth of *Sparisoma* are usually in many series—from six to nine—and all but the outermost are firmly coalescent into a solid plate approaching those of *Scarus* proper, Posterior canines are present in both genera. As far as known, *Scaridea* is confined to the Hawaiian Islands, while, except for one Mediterranean species, *Sparisoma* is found only in the general region of the West Indies.

ANALYSIS OF HAWAIIAN SPECIES OF SCARIDEA

a^1. Body with a broad brassy yellow cross band just back of tip of pectoral; lower part of head irregularly blotched with bright scarlet ---- aërosa.
a^2. Body without brassy crossband; no bright scarlet on head.

[17] Fishe der Südsee, vol. 3, p. 300.

b^1. Body rather elongate, its depth less than one-third the length to base of caudal, fins mottled with dusky but not strongly barred; sides of body not spotted with white ..... farrandi.

b^2. Body rather deep, its depth considerably more than one-third the length.

c^1. Sides of body with scattered pale round spots; anal nearly plain, not strongly barred ..... balia.

c^2. Sides of body without prominent pale spots, sides obscurely cross-banded with darker; and with three distinct oblique cross bars ..... zonarcha.

SCARIDEA AËROSA Jordan and Snyder.

Two specimens were obtained in the Honolulu market, and, as the original diagnosis was from preserved material, a description of the life colors is here given.

Ground color of body dull brownish, passing into a bluish gray on belly and somewhat mottled with lighter brown and grayish white, the posterior margin of scales the lighter. A broad, nearly vertical band of greenish golden brassy, four scales in width, on middle of side, narrowing to one scale on belly and back, encircles body between sixth dorsal spine and the scale just before the anal opening.

Head generally brownish like body, but below level of mouth largely covered by an irregularly outlined blotch of bright scarlet, broken by a brown band uniting corners of mouth, and by another across isthmus. An irregular orange line runs up along upper lip, but not completely across snout. Behind eye are a few scattered spots of golden orange; there is no suggestion of regular markings on head however. Axil of pectoral flushed with rose.

Vertical fins dusky, irregularly mottled with lighter and darker; a conspicuous black spot between first and second dorsal spines, another on third from last dorsal ray. Ventrals bluish gray, with faint brownish stains. Pectorals bluish and brownish, touched with greenish gold toward their tips.

Teeth white; some scarlet on inside of mouth.

Another specimen is colored similarly except that the scarlet area on head is slightly less extensive, and the brassy crossband is wider and slopes more obliquely backward.

In spirits, the red colors are at once lost, changing to a dirty grayish, quite inconspicuous. Consequently in the original description and figure no mention is made of the most striking character of the fresh fish. The brassy crossband seems to be reasonably permanent.

This is without doubt the species which Bryan,[18] from a painted cast in the Bishop Museum of Honolulu and the preserved specimen from which the cast was made, described and photographed as "*Scaridea zonarcha* Jenkins, or else new species," but to which he gave no name.

[18] Bryan, William Alanson, Occ. papers of the Bernice Pauahi Bishop Museum, vol. 2, No. 4, p. 35.

SCARIDEA FARRANDI E. K. Jordan, new species.

Plate 1, fig. 4

Head 3.4 in length; depth 3.1; eye 5.5 in head; interorbital 4.5; scales 2-25-5; D. IX, 10; A. III, 9.

Snout blunt, the anterior outline steep between tip of snout and interorbital space, then sloping gently backward to origin of dorsal; jaws nearly equal, the lower slightly included; cleft of mouth not quite reaching anterior edge of orbit; teeth of upper jaw on outer edge of dental plate in 3 series for about half length of jaw, where they are followed by a short space without teeth, then by a single, strong curved canine which projects outward and backward; lower jaw with 3 rows of teeth anteriorly, 2 laterally, and 1 posteriorly; dorsal spines stiff and sharp; little difference in height of spinous and soft dorsals; anal spines rather slender and flexible; anal rays similar in height to soft dorsal, 2.4 in head; dorsal and anal extending an equal distance posteriorly; ventrals rounded; pectoral 1.5 in head; caudal evenly rounded, the middle rays longest; lateral line parallel to dorsal profile to a point below posterior end of dorsal, where it is abruptly bent downward, passing along middle of caudal peduncle; tubes of lateral line prominent and greatly branched; scales on occiput and opercles, a single row passing obliquely downward on cheek below eye; three scales on median line anterior to origin of dorsal.

Color of a specimen after about a month in formalin, light brownish gray, indistinctly mottled with lighter gray, golden brown, and nearly black on occasional scattered scales; belly lighter than sides or back, and brown rather than gray in general color; a narrow blackish line, formed by horizontal dark dashes on the center of each scale, running backward to a point about opposite origin of anal, above, another similar line a little longer but much fainter, below a fairly distinct line a little shorter, and below that, on belly, a faint suggestion of another, making four such lines in all, two of them prominent; no other regular markings anywhere on body; head without regular markings, similar in color to body; no suggestion of the dull whitish color to which scarlet fades; a light yellowish patch between the eyes; iris golden; teeth white; vertical fins pale, faintly mottled with dusky, no distinct dark edgings or bands although dark stains on dorsal are arranged to some extent along oblique crosslines, very faint; no suggestion of banding on anal; a prominent black spot between first and second dorsal spines; pectorals pale, ventrals pale, the tip of first ray blackish.

But one specimen, the type, measuring 9 inches in length, was obtained from the Honolulu market. Its catalogue number is 87416, U.S.N.M.

This species is of the same general type as *Scaridea aërosa* which it resembles almost exactly in outline and other characters, but the two species differ utterly in coloration. *S. farrandi* lacks the golden or brassy crossband, lacks the large scarlet patches about the head, is much lighter in ground color, and shows longitudinal lines upon the lower side. From other species of the genus it differs in the more elongate body and the strongly convex anterior profile.

I take pleasure in naming this species for Dr. Livingston Farrand, President of Cornell University, in recognition of his interest in this collection of fishes.

SCARIDEA BALIA Jenkins.

A second specimen is recorded by Fowler.

SCARIDEA ZONARCHA Jenkins.

A small, deep bodied, compressed species, with strongly obliquely barred anal and generally mottled appearance, known only from three specimens obtained by Jenkins at Honolulu in 1889.

Genus SCARUS Forskål

ANALYSIS OF HAWAIIAN SPECIES OF SCARUS (TEETH NOT BLUE)

a^1. General life color brownish, dull reddish or dull gray, with little or no blue or green in markings or ground color.

b^1. Cheek with but one complete row of scales extending below eye; posterior canine wanting; caudal scarcely emarginate.

c^1. Head with scattered light olive spots, and with a light brown divided saddle before eye, this area bordered with greenish blue, and margined with purple ..... **kraussi.**

c^2. Head without distinct markings.

d^1. Edge of dorsal and anal marked by a distinct bluish line, turning dusky in spirits ..... **miniatus.**

d^2. Edge of dorsal and anal not marked by a dark line.

e^1. Body rather deep, its depth notably more than one-third the length; base of caudal with a pale bar ..... **ahula.**

e^2. Body rather elongate, its depth notably less than one-third the length; caudal fin uniformly shaded, without pale bar at base. **borborus.**

b^2. Cheek with two or more full rows of scales below eye; posterior canine normally present, but often wanting; caudal more or less emarginate.

f^1. Side of belly with three distinct whitish longitudinal stripes; posterior canine wanting ..... **dubius.**

f^2. Side of belly without distinct white stripes.

g^1. General body color dark leaden gray verging on violet; posterior canine usually but not always present.

h^1. Upper lip, when fully extended, not completely covering teeth; caudal lunate, with an abrupt white band at tips of rays ..... **galena.**

h^2. Upper lip, when fully extended, completely covering teeth; caudal practically truncate, without white band at tip. **erythrodon.**

g^2. General body color reddish or brown, not dark leaden gray nor violet.

i^1. Caudal fin deeply emarginate; posterior canine usually wanting, occasionally present ---------- brunneus.

i^2. Caudal fin truncate ---------- paluca.

a^2. General color in life largely brilliant blue or green.

j^1 Head with a broad greenish or purplish saddle before eye, this area continuous from side to side and bordered by bright greenish blue; posterior canine wanting or small; head and fins with elaborate markings of blue and green; caudal subtruncate. perspicillatus.

j^2 Head without peculiar markings as above; caudal fin lunate, with produced angles.

k^1. Body relatively slender, the depth 2⅔ to 3 in length; dorsal fin largely red or orange, banded with blue or green.

l^1. Dorsal fin orange, with a broad undulating blue band above, edged above and below with darker blue; blue spots on base of each membrane; anal similar; caudal edged all around with blue. formosus.

l^2. Dorsal fin red, with a green median streak and a blue margin; anal similar; caudal with four curved blue cross bands ---------- bataviensis.

k^2. Body relatively deep, the depth 2½ in length; dorsal fin not largely red or orange.

m^1. Dorsal fin green at base and along edge, the middle portion paler; caudal with green spots. jenkinsi.

m^2. Dorsal fin narrowly blue on base and border, the two areas separated by a broad, dusky whitish band; caudal crossed by a subterminal blackish line ---------- gilberti.

SCARUS KRAUSSI E. K. Jordan, new species.

Plate 2, fig. 1

Head 3 in length; depth 2.7; eye 6 in head, snout 2.6; interorbital 2.7; D. IX, 10; A. III, 9; P. 14; scales 2—24—6.

Body moderately deep, stout, not closely compressed; profile of top of head straight, running into a dorsal profile that is evenly convex from beginning of dorsal fin to caudal peduncle; snout very blunt, as if chopped off, its tip slightly in advance of mouth; mouth on axis of body; jaws unequal, the lower included; teeth pinkish dusky, white at tip; no posterior canine; upper lip double only close to corner of mouth, only covering about half the dental plate; lower lip very narrow, covering less than half the dental plate; cheek with but one complete row of scales; a second lower row is represented by 3 small scattered scales; lower limb of preopercle naked; opercle scaled, scales on lower limb smaller or partially embedded; 4 scales on median line in front of dorsal; lateral line interrupted under base of

last but one dorsal ray, reappearing two scales below and continuing to caudal; tubes of lateral line variously branched, much so on some scales, hardly at all on others; in general the complexity of branching decreases posteriorly.

Dorsal spines flexible, their length about 3.3 in head; dorsal rays slightly elevated, about 3 in head, and similar to soft anal; caudal truncate; ventrals fairly long, about 2.2 in head; pectorals much longer, 1.4 in head, the posterior edge evenly curved and the uppermost rays not produced.

Color in life greenish brown, becoming pinkish below on breast and belly; each scale with a rather broad border of dark reddish brown; on sides of belly the greenish is reduced to light blue spots on a pinkish ground; head somewhat reddish, marked with sky blue; an irregular brown area, vertically oblong, bordered with bright blue and margined with purple before each eye, these two patches not quite united over median line; various light blue and olive spots and dashes on sides of head; lips brownish pink; an irregular, oblong, bluish area behind lower lip, extending to both sides; teeth pale rosy. Pectorals brown, the first ray blue, a dull blue cross streak before base; ventrals light orange, the first ray blue; caudal dusky, the outer rays slightly darker; dorsal with a blue green stripe along base, then light orange, then a diffuse stripe of pale green, then a stripe of darker orange a bit wider than others, a narrow blue black margin; anal similar, the orange and blue brighter.

Color in spirits dull brown, lighter below, the margins of scales lighter; the markings on head retained, but the blue faded to yellowish white and the purple to dusky; teeth rosy brown. Dorsal and anal whitish, margined with dusky, this margin particularly abrupt and prominent on anal, the dorsal obscurely darker at base; pectoral clear, obscurely streaked with brownish, and darker at base; ventrals pale, a little darker on first ray and at tip.

In a general way the life color pattern resembles that of *S. perspicillatus*, but this fish is essentially brownish in life and not bright green. The fins, also, are not banded as in *S. perspicillatus;* the saddle before the eye is more irregular and not continuous over the top of head; and the lower lip lacks the broad, solid band.

A single specimen, the type, 14⅔ inches in length, was taken in the Honolulu market. It is Cat. No. 87417 U.S.N.M. Named for Prof. Frederick G. Krauss, of the University of Hawaii, with whose family the writer resided while in Honolulu, and who kindness and generosity were unfailing.

SCARUS DUBIUS Bennett.

Scarus dubius BENNETT, Zool. Journ., vol. 4, p. 828, no. 13, art. 3, p. 37. Oahu.

Scarus bennetti CUVIER and VALENCIENNES, Hist. Nat. Poiss., vol. 14, p. 270, 1839. Oahu, same example.

Callyodon bennetti JORDAN and EVERMANN, U. S. Fish Comm. Bull., vol. 23, pt. 1, p. 352, with plate. Honolulu.

Pseudoscarus dubius GÜNTHER, Fische der Südsee, vol. 8, p. 313.

This species has passed as *Scarus bennetti* Cuvier and Valenciennes, which name, however, was given somewhat later than *dubius*. The two species are said by Günther to have been founded on the same type specimen. Unfortunately, the name *dubius* was later misapplied to the fish here named *Scarus galena*, and the name *bennetti* accepted for the present form, which is distinguished by the three longitudinal white streaks along side of belly; the ground color is lead gray.

SCARUS GALENA E. K. Jordan, new species.

Pseudoscarus dubius GÜNTHER (not Bennett) Cat., vol. 4, p. 229, 1862.

Callyodon dubius JORDAN and EVERMANN (not Bennett), U. S. Fish Comm. Bull. 23, pt. 1, p. 350, pl. 44, 1903.

Head 3.1 in length; depth 3.1; eyes 6 in head; snout 3; preorbital 5; interorbital 3.2; D IX, 10; A. III; P. 14; scales 2–25–6.

Body moderately elongate, not deep, and not greatly compressed; head short; snout short; mouth small, horizontal, slightly below axis of body, lower jaw included; upper lip covering about two thirds of upper dental plate, lower lip leaving about one-half of lower teeth exposed; a well developed posterior canine in upper jaw of most specimens, this occasionally obsolete or lost; teeth white; eye small, lower edge of orbit in line with axis of body; interorbital space wide, broadly convex; scales large, 4 on median line before dorsal; 2 complete rows of scales on each cheek below eye, a third row occasionally represented by one or two small scattered scales, partially embedded; subopercle with a single row; opercle scaled; lateral line interrupted under last dorsal ray, to reappear again 2 rows farther down, 18 pores in the first and 7 in the last; tubes of lateral line with very short branches.

Dorsal spines soft and flexible, their length scarcely equalling snout; soft dorsal not elevated, the border of the entire fin uniformly rounded; anal similar to soft dorsal, its rays equalling snout; caudal lunate, the outer rays somewhat, though not greatly produced, their relative length variable; pectoral not quite reaching origin of anal.

Color of specimen after about a month in formalin but probably little altered, deep leaden gray, very little lighter on belly, the center of each scale darker; no distinct markings of any kind on body or head; pectorals and ventrals pale; vertical fins all dark and uniform except for the caudal which is abruptly tipped with pale.

Four examples of this species were taken by me in the market of Honolulu.

The type is Cat. No. 87418, US.N.M., taken by me in the market of Honolulu. In the museum of Stanford University are No. 8781, from Honolulu, and 8784, from Samoa. Also 23374, from Honolulu.

This fairly common species is well figured and described in Jordan and Evermann (from whom the above diagnosis is modified) as *Callyodon dubius* Bennett, following Günther. The name *dubius* however, has been shown to belong to the fish later called *Scarus bennetti;* by Cuvier and Valenciennes, and the present form is left nameless.

(*Galena*—lead ore, a dark gray lead sulfid mineral, from the life color.)

SCARUS BRUNNEUS Jenkins.

A specimen about 2 feet in length, apparently belonging to this species, was seen in the Honolulu market. The fish being so large, only the head was taken, but this agrees well with Jenkins's type. The color was dark reddish brown, the vertical fins broadly edged with a dusky wash. An inconspicuous posterior canine is present; in a smaller fish, however, this would easily be overlooked. No specimen of *Scarus brunneus* has previously been reported over 9 inches in length.

SCARUS BATAVIENSIS Bleeker.

Recorded from Honolulu by Steindachner.

Genus PSEUDOSCARUS Bleeker

Those species of *Scarus* having the jaws blue may properly be regarded as generically distinct from those with the jaws whitish or pale rosy. The blue coloration is permanent, is found at all ages, and is not altered by preservation in spirits. It seems to represent a very high degree of specialization. The body coloration in this group, usually, but not always, green or blue, is more specialized than that of *Scarus* proper.

ANALYSIS OF HAWAIIAN SPECIES OF PSEUDOSCARUS

a^1. Caudal rounded or simply lunate.

b^1. Caudal rounded, bright bluish green; belly pale green with several blue-green longitudinal stripes; upper part of body between pectoral and caudal peduncle yellow; pectoral blue-green; dorsal blue-green, with red stripes ..... **vitriolinus.**

b^2. Caudal lunate, red; belly without stripes; body without large yellow area on side; pectoral yellow with the first ray only blue; dorsal red with blue trimmings ..... **troscheli.**

a^2. Caudal with the outer rays much produced, often more than twice the length of middle rays.

c^1. Color below as above deep greenish blue, the middle of sides with a rosy shade; head with yellowish streaks below, and another from upper lip to eye; caudal blue-green, the middle rays tipped with orange; pectorals broadly orange behind; orange on base of ventrals ..... **jordani.**

c^3. Color on lower part of body not deep green nor blue as on back; several streaks radiating from eye.

d^1. Streaks radiating from eye greenish; body brown above anteriorly, posteriorly green; sides salmon red; head with brown and blue markings; dorsal orange, edged with blue and with blue markings; caudal ochraceous, the outer rays blue and green, a subterminal green bar_____ **heliotropinus.**

d^2. Streaks radiating from eye red; body greenish above over whole length; sides pink, becoming yellow below and grayish green on belly; head and snout with irregular red streaks, the upper lip red; dorsal red, with a blue margin and a row of blue spots at or near base; anal blue, with a rosy longitudinal band; caudal with outermost rays blue, the next two red, the inner rays green with a terminal ochraceous bar_____ **xanthopleura.**

PSEUDOSCARUS VITRIOLINUS Bryan.

This species was hitherto known only from a single example. We secured a second in the market at Honolulu. After about a month in formalin it shows the following coloration:

Dorsal–anterior part of body pale yellowish green, the anterior portion of scales lighter, the posterior margin colorless; this greenish becomes more and more yellowish posteriorly till beneath the soft dorsal the sides of the body are a golden brown, with only a very faint greenish cast; caudal peduncle quite abruptly bright blue-green; belly anteriorly similar in color to sides, but striped longitudinally with blue-green, there being three such stripes running from a point opposite origin of ventrals horizontally backward as far as the anal on each side, the median line of belly also blue-green; back of the origin of anal these stripes merge into a generally green area that covers belly and extends to the blue caudal peduncle; breast green, without distinct markings; back of body also more or less green throughout, nowhere yellow or brown like sides. Upper part of head and anterior portion of lower jaw blue-green; four yellowish stripes radiating from eye; opercle mostly dark violet brown, a blue scale over axil of pectoral, cheeks yellowish, snout and lower lip gray. Dorsal bright blue-green, a single whitish band along spinous part, on soft dorsal this splits into two, the two bands connecting again along the membrane between the last two rays; anal similar, though with but one basal band; caudal bright blue, more greenish toward center, spotted here and there with white; pectorals bluish green, their tips white; ventrals dull greenish, the first rays brighter. It seems likely that much of the area here described as whitish was originally of some shade of red.

PSEUDOSCARUS TROSCHELI (Bleeker).

This species, recorded by Steindachner from Laysan, is reported by Fowler from Honolulu.

PSEUDOSCARUS HELIOTROPINUS Bryan.

This species, known only from a single specimen and a painted cast in the Bishop Museum, is extremely close to the East Indian *P. xanthopleura* (Blecker), differing only in certain details of color.

Below I quote Bryan's original description of *Pseudoscarus heliotropinus* from the Director's report of the Bishop Museum for 1905 (p. 23, fig. 3). This paper, in which a number of Hawaiian *Scari* are described, three of them new, is little known.

Head 3.2 in body; depth 3.1; eye 8 in head; interorbital 2.6; D. IX, 9; A. II, 9; P. 14; scales 2–25–7.

Body very stout; head deeper than long; snout blunt, the dorsal outline strongly convex, the anterior profile rising almost vertically from the lips; teeth blue; upper jaw with one or two blunt canines; depth of caudal peduncle 2 in head; scales deeper than long; two rows of large scales on the cheek, one row on the subopercle; lateral line interrupted under the last dorsal ray, but continued on the second row below; pores with two or three irregular branches; anal and dorsal about equal in height; caudal deeply lunate, the outer rays extending beyond center rays twice the length of latter; ventral 1.8 in head, falling short of anal by 0.6 their length; pectoral broad, 1.2 in head.

Color in formalin + alcohol. General color, grayish brown; brownish over the snout; an indistinct greenish patch on the cheek and lower lip; ventral margined and tipped with greenish, remaining portion pale; dorsal with a greenish base and margin; caudal like the body, but with outer streamers and two or three ill-defined spots greenish; base and outer third of the anal greenish, portion between pale; pectoral pale, with an indication of green. Teeth blue.

Color (based on plaster cast colored from life). General color of lower half of body, pale salmon, varied with bluish scale markings; dorsal anterior half of body back to tip of pectoral heliotrope brown; remainder of dorsal portion as well as caudal peduncle pure green, varied with pinkish scale markings; interorbital region greenish brown; upper lip green, edged with orange-ochraceous; an ill-defined brown stripe over the middle of the snout; a broad orange-ochraceous patch on the lower lip, which is bordered above and below with blue, the latter color joining at the angle of the mouth, becoming a greenish blue patch on the cheek which is crescent-shaped on its posterior outline, one point of the crescent reaching to the eye; greenish stripes radiating from the eye, narrow greenish stripe connecting the points of the crescent on the cheek; scales on the cheek greenish; chin flesh color, with a few irregular blue spots; dorsal edged with blue; blue marks along the bases of the third to sixth spine; remaining rays with serrate green ray marks; remainder of the fin salmon color; anal broadly margined with blue; blue membrane spots at base, forming an irregular line; remaining portion salmon-pink; caudal with the outer rays blue passing into green, the green extending over most of the elongated rays; inner edge of the elongated rays and central portion of the tail ochraceous-salmon; four large irregular green blotches on the middle rays arranged so as to form a subterminal bar, with its posterior edge one-fourth of the length of the middle rays from the margin of the caudal; a few blue spots between the blotches and the base of caudal; ventrals salmon color, the outer ray for its entire length, the second for its distal half blue; pectoral green; iris yellow.

The type (B. P. B. Museum No. 3363) here described was secured in Honolulu market February 8, 1903, and measures 22 inches.

PSEUDOSCARUS XANTHOPLEURA Bleeker.

This East Indian species is reported by Fowler from Honolulu. Fowler regards it as distinct from *P. heliotropinus* Bryan, which it certainly resembles.

Family ECHENEIDAE

Genus REMOROPSIS Gill

REMOROPSIS BRACHYPTERA (Lowe).

Reported by Fowler.

Family GOBIIDAE

OPUA E. K. Jordan, new genus

(*Type.—Opua nephodes* E. K. Jordan.)

This genus, with *Mugilogobius* and *Vaimosa*, differs from other genera of *Gobiidae* in having scales on the upper part of the opercle, but none on the cheeks. From *Vaimosa* and *Mugilogobius* it is distinguished by the larger scales, which do not decrease in size anteriorly; by the larger teeth in several series, with two moderate canines in the middle of the side of the lower jaw, and by the shape of the head, the interorbital being much narrower and not flattened above. The dorsal spines are not prolonged into filaments as in *Mugilogobius*.

(*O'opu*—Hawaiian name for gobies.)

OPUA NEPHODES E. K. Jordan, new species.

Plate 2, fig. 2

Head 3.4 in length; depth 4.5; eye 3.2 in head; depth of caudal peduncle 3; snout 4; D. VI–10; A. 10; P. 18; scales in lateral series 26, in transverse series 9.

Body elongate, moderately compressed, evenly tapering from the greatest depth just behind the head to caudal peduncle; head not large, rather narrow, moderately pointed, not flattened above; interorbital space very narrow, slightly concave, its width about 5 in diameter of eye; eyes large, directed laterally and more or less upward, the lowermost point on orbit lying slightly above axis of body; snout blunt; mouth oblique, at a considerable angle, small, not quite reaching anterior edge of pupil; jaws equal; upper side of snout with a number of parabolic ridges parallel to each other and opening forward; cheeks and snout naked, without scales or prominent papillary ridges; lower part of opercle naked; upper third of opercle scaly, there being two rows of large ctenoid scales similar to those on body, 4 scales in lower row and 5 in upper, a few other very small ones above; preopercular margin entire, no spines anywhere on head; teeth in upper jaw conic, simple, in many series, 3

series more strongly developed than others, no true canines in upper jaw, though the outermost series approach canines in front; lower jaw with numerous series of strong backward curved, thin, hook-like teeth, the outermost series the strongest, 2 backward directed canines much larger than other teeth in the outermost series at each side of lower jaw, of these the posterior is the longer; no teeth on vomer; tongue bluntly rounded at tip; body covered with large, ctenoid, obscurely longitudinally striated scales, these about equal all over body, about as large anteriorly as posteriorly, the scales on back anterior to first dorsal are a little smaller, however; dorsal fins rather low, separate from each other, and from caudal, the middle spines of first dorsal not prolonged into filaments; anal similar to soft dorsal; pectoral moderately long, entire, the middle rays the longer; ventrals completely united, free from belly; caudal somewhat pointed, the middle rays longer than the outer.

Ground color yellowish white all over, much mottled, streaked, and clouded with olive brown; under a lens the dark markings appear as closely spaced groups of fine dots; a row of about five dark clouds down median line of each side; sides obscurely longitudinally striped with dark, about 6 such stripes, the belly pale, somewhat clouded, but without distinct markings; head rather dark, without distinct markings, the interorbital space and the top of snout dark; dorsal dark, obscurely longitudinally banded with lighter; anal nearly black, not banded; caudal with distinct light and dark cross bars; ventrals nearly black in male, dusky in female, not banded. The above description is from alcoholic specimens, but applies equally well to the color in life; in life the fish is perhaps a little darker in general appearance, but there is no color anywhere other than gray and olive brown.

Twelve specimens from 1 to 2 inches in length were taken in the Honolulu market. They were picked out of a pile of small brackish water gobies, and presumably came from one of the muddy brackish lagoons near Honolulu.

Type.—Cat. No. 87419, U.S.N.M.; paratypes are cat. no. 23612, in Stanford University Collection; paratypes are in Cornell University and in the University of Minnesota.

Genus GOBIOPTERUS Bleeker

GOBIOPTERUS FARCIMEN Jordan and Evermann.

A second specimen of this little rock goby is recorded by Fowler.

Genus CHLAMYDES Jenkins

CHLAMYDES LATICEPS Jenkins.

A second specimen of this little fish is recorded by Fowler from Laie, Oahu.

Family TRICHONOTIDAE

Genus CRYSTALLODYTES Fowler

CRYSTALLODYTES COOKEI Fowler.

A minute translucent fish burrowing in the sand, described by Fowler from Laie Beach, Oahu, where it was found by Charles Montague Cooke, III.

Family BLENNIIDAE

Genus CIRRIPECTES Swainson

CIRRIPECTES ALBOAPICALIS Ogilby.

Recorded by Fowler.

Genus SALARIAS Cuvier

SALARIAS MELEAGRIS Valenciennes.

Recorded by Fowler from Laie.

Genus ENCHELYURUS Peters

ENCHELYURUS EDMONDSONI Fowler.

A very minute fish found on the reef of Homonumi, Molokai, by William Alanson Bryan. From the equally minute *Enchelyurus ater* it is distinguished by varied coloration, as *ater* (=*brunneolus* Jenkins) is uniform black. These species, with *Eviota epiphanes* and *Enneapterygius atriceps*, all less than 2 inches in length, inhabit coral heads.

Family FIERASFERIDAE

Genus FIERASFER Cuvier

(*Carapus* Rafinesque in part.)

(The International Commission of Zoological Nomenclature has decided that the name *Carapus* is eligible for this genus in place of *Fierasfer*. It seems to me that in a case as doubtful as this we may well follow common usage.)

FIERASFER HOMEI (Richardson).

An additional specimen is recorded by Fowler.

Genus JORDANICUS Gilbert

JORDANICUS UMBRATILIS (Jordan and Evermann).

This species, mottled black in life and not translucent, is occasionally found in the body of a large black Holothurian. It is perhaps the species noted by Fowler as *Jordanicus gracilis* (Bleeker) from Kahala, Oahu. The two forms are regarded as identical by

Günther,[19] but *gracilis* is described as "yellowish, blackish posteriorly," which does not correspond to the dark coloration of *umbratilis*.

Family LOPHOTIDAE

Genus Lophotes Giorna

LOPHOTES CAPELLEI Schlegel.

Recorded by Fowler, from Laysan.

Family BALISTIDAE

Genus PARABALISTES Bleeker

Cheeks mostly naked; no spines on tail; ventral spine movable; dorsal and anal elevated; caudal lobes filamentous in the adult.

PARABALISTES FUSCUS Schneider.

Recorded by Fowler.

Genus CANTHIDERMIS Swainson

CANTHIDERMIS ANGULOSUS Quoy and Gaimard.

This rare species, figured by Jordan and Jordan, is probably the one recorded by Fowler as *Canthidermis maculatus* Bloch. The body is covered with round white spots.

CANTHIDERMIS ROTUNDATUS Procé.

Recorded by Fowler. This species, as described by Procé,[20] is said to be brown with black dots; D. III–26; A. 21. Scales tricuspid; equal; tail unarmed.

Family MONACANTHIDAE

Genus CANTHERINES Swainson

Pseudomonacanthus Bleeker, with pronounced barbs on the dorsal spine, can not be separated from *Cantherines*, in which the spine is simply rough; there is a perfect gradation between the two types.

CANTHERINES SANDWICHIENSIS Quoy and Gaimard.

A common species, the body color in life nearly uniform black, with orange dorsal and anal. The snout is hardly paler than the rest of body; caudal nearly black, not barred with lighter. Ventral flap not much enlarged; dorsal spine very long and slender, its length nearly equal to that of head, the surface of the spine not very rough. *C. pardalis* Rüppell of the East Indies may be distinct, but *C. carolae* Jordan and MacGregor, of the Revillagigedo Islands

[19] Fische der Südsee, vol. 8, p. 339, 1909.

[20] Sur plusieurs espèces nouvelles de Poissons et de Crustacés observeés par M. Marion de Procé, Manila, 1822.

off the west coast of Mexico, seems to be the same. In *C. carolae* the dorsal spine is a little shorter than in *C. sandwichiensis*. The two species are considered identical by Jordan and Evermann, as by Jordan and Jordan.

CANTHERINES VERECUNDUS E. K. Jordan, new species.

Plate 2, fig. 3

Head 3 in length; depth 1 to 1.6; eye 3.6 in head; snout 1; interorbital 3; D. 1–34; A. 31; P. 13.

Body oblong, moderately elevated; snout long; mouth small; anterior profile gently concave, a little convex in front of eye; from dorsal spine to caudal peduncle the dorsal outline is a long, low curve; jaws with strong incisors, the lower included, the teeth white with golden brown tips; eyes high up, the interorbital elevated; gill slit oblique; ventral flap wide; body uniformly sandpapery; dorsal spine short, stout, straight, distinctly rough but without true superimposed hooks or spines, its length about 1.8 to 1.9 in head; dorsal groove short, shallow posteriorly, reaching only about two-thirds of the distance back from base of dorsal spine to origin of soft dorsal; distance between origin of soft dorsal and dorsal spine slightly greater than from snout to eye; dorsal relatively low; its rays from about fourth to eighth somewhat elevated, their length about half head; anal similar to soft dorsal; caudal truncate, slightly convex; pectoral short, its length 2.5 in head; pelvic spine stiff, not movable, projecting little beyond the broad ventral flap.

Color in life dull olive brown, usually with about 4 obscure darker saddles crossing belly between pelvic spine and snout; 2 similar saddles crossing forehead, 1 just in front of eye, and 1 just above snout, this obscurely connected around snout to the dark patch below, 2 similar saddles on back between dorsal spine and origin of soft dorsal, about 3 more crossing back and belly beneath soft dorsal and anal, respectively; 2 narrow bands on top and bottom of caudal peduncle, none of these bands or saddles connecting across sides of body except just behind snout; sides of body mottled, blotched, and clouded with lighter and darker, never uniform but with no distinct or constant markings whatever; lips abruptly pale; vertical fins dusky brownish, the rays darker, the membranes pale, no red, orange, or clear yellow anywhere; caudal distinctly vertically barred; pale at base, then nearly black, then pale, then broadly black to tip, 2 light and 2 dark bars in all. Some specimens are almost plain dark olive brown, the figure here presented being taken from one of these. One example shows a row of round white spots along base of anal.

Color in spirits not materially changed, the cloudings slightly fading.

Seven specimens taken in the Honolulu market, all from 4 to 5½ inches in length; two others in Stanford University (Cat. No. 8465) collected by E. L. Berndt in Honolulu.

Type.—Cat. No. 87420, U.S.N.M. cotypes are Cat. No. 23373 in the Stanford University collection; a paratype is at Cornell University.

This species is related to *Cantherines sandwichiensis* (Quoy and Gaimard) the common species about Hawaii, but it differs markedly in color, being a dull olive, mottled and clouded, but without black or white spots; the fins are a paler olive. In *C. sandwichiensis* the body is uniform plain brownish black, not clouded with darker, usually with small round black spots more or less numerous on head and anterior parts. The dorsal and anal fins in *C. sandwichiensis* are higher than in *C. verecundus* and bright orange red in life and the caudal plain blackish. In *C. verecundus* the caudal has two diffuse crossbars of blackish with paler interspaces and the dorsal and anal are plain dusky brown, without red or orange. The dorsal spine in *C. verecundus* is shorter, stouter, and rougher, and the ventral flap (more or less) deeper than in the other, this feature being subject to some variation.

The third species of *Cantherines* recorded from Hawaii, *C. albomaculatus* Seale (*C punctulatus* Regan) has the body marked with profuse white spots. *C. armatus* Garman from Fiji has more than 40 dorsal and anal rays. *C. nigricans* Macleay from New Guinea has the rays, D. 26, A. 23. *C. fuliginosus* Macleay also from New Guinea, with long dorsal spine is apparently quite distinct.

(*Verecundus*, modest.)

Genus MONACANTHUS Cuvier

MONACANTHUS SPILOSOMUS Lay and Bennett.

The genus *Stephanolepis*, distinguished from *Monacanthus* by the narrowness of the ventral flap, can hardly be maintained as the character is subject to intergradations.

Family TETRAODONTIDAE

Genus LAGOCEPHALUS Swainson

LAGOCEPHALUS OCEANICUS Jordan and Evermann.

In a cast in the Bishop Museum, the back is nearly black, the sides abruptly silvery, but with no trace of the round black spots seen in the original types. This species stands at the extreme of a series, which in Japan shades off by degrees into the genus *Sphoeroides* Lacépède. *Sphoeroides* is the original form of this word first used in an unsigned review of Lacépède 1798. *Spheroides* dates from 1806.

TETRAODON HISPIDUS Linnaeus.

This fish is very common at Honolulu and its flesh has the reputation of being highly poisonous, producing the dreaded disorder known in Cuba as Ciguatera. It is, however, brought into the markets, where it is skinned and the viscera removed, the flesh itself being regarded as innocuous. Fishermen say that the poison is in the gall bladder. The pathology of Ciguatera is much in need of study.

This fish is generally known as *Tetraodon hispidus* though it may not be the same as the original *hispidus* of Linnaeus. This is based on a specimen brought by Magnus Lagerström from China.

Dr. Einar Lonnberg, who has examined this type,[21] says of it: "The type of *Tetraodon hispidus* Linnaeus is probably the same species as *T. hispidus* of other authors, but it can not be proved certain without comparison with other types. The spines of the belly are rather long and like bristles. The specimen is discolored." In view of this statement it is doubtless safest to retain the same *hispidus*, rather than exchange one doubtful opinion for another. The next name in point of time after *hispidus* is apparently *Tetraodon perspicillaris* Rüppell, from the Red Sea, which agrees fairly with Hawaiian examples. *Ovoides erethizon* Jordan and Gilbert from Panama is certainly the Hawaiian fish.

This species is not *T. implutus* Jenyns, nor *T. laterna* Richardson. Bleeker regards these as identical but figures the species as having the pale spots ringed with black, which is not the case with the Hawaiian form.

The stripes on the belly in *T. hispidus*, black anteriorly, yellow farther back, vary much with age, often fading as the fish grows older.

There is some variation in the coloration of this fish in Hawaiian waters, some individuals having few large round white spots on a dark background to others with the back covered with many smaller, pearly bluish spots. These forms can not be farther separated, but no examples from Hawaii are without white spots.

Genus LIOSACCUS Günther

LIOSACCUS CUTANEUS Günther.

Recorded by Fowler.

Genus CANTHIGASTER Swainson

CANTHIGASTER MARGARITATUS (Günther).

Recorded by Fowler.

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[21] Kong. Svensk Vet.-Akad., Handl., vol. 2, pp. 22, 30.

Family OSTRACIIDAE

Genus OSTRACION Günther

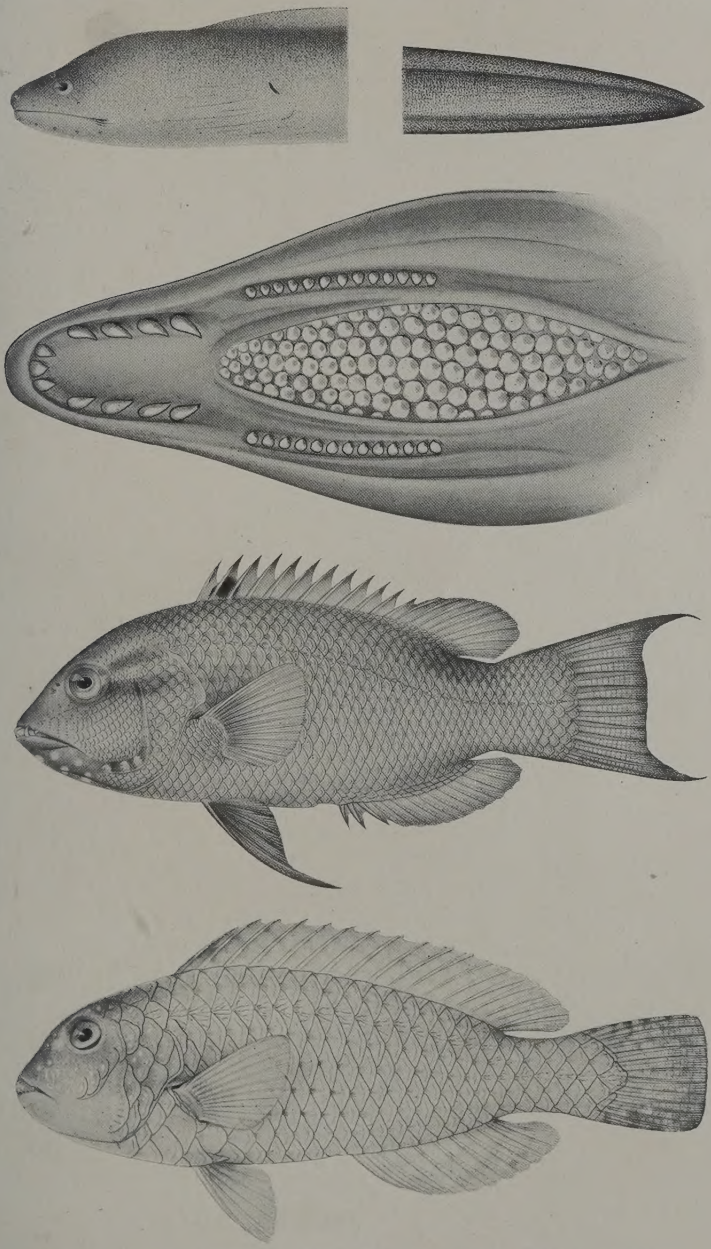
OSTRACION CUBICUS Linnaeus.

Recorded by Fowler.

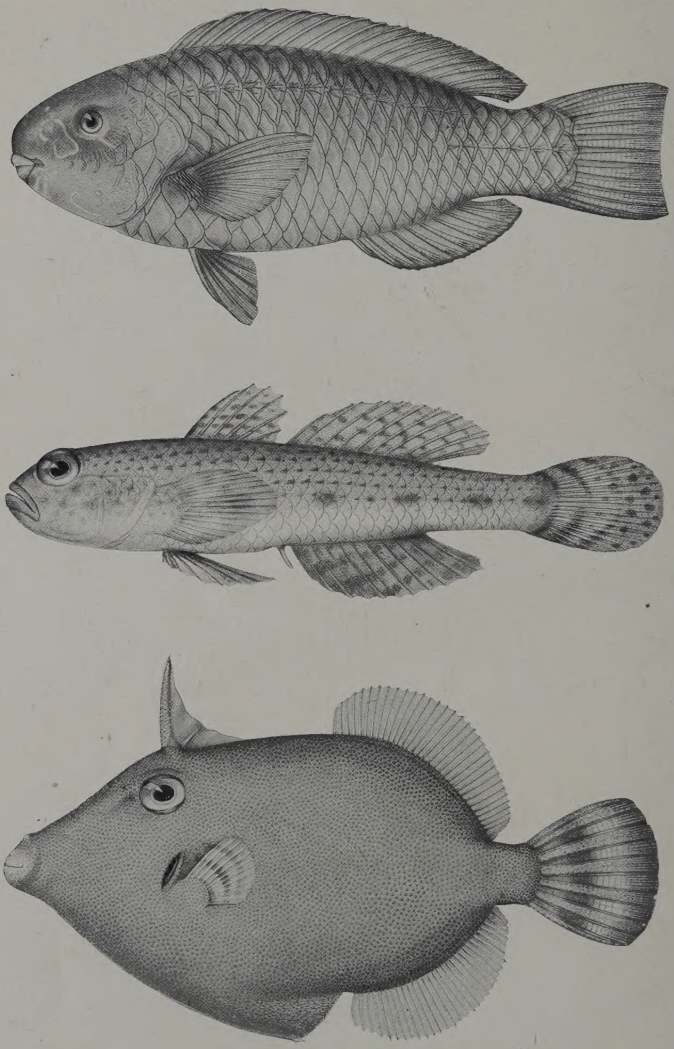
Genus LACTORIA Jordan and Fowler

LACTORIA GALEODON (Jenkins).

Two rather small specimens, though larger than the original types, about 3 inches in length, were obtained in the Honolulu market. This species is apparently wholly distinct from *L. diaphana* of Japan.



LEIHALA TRITOR (PAGE 5); UPPER TEETH OF SAME (PAGE 5); LEPIDAPLOIS ATRORUBENS (PAGE 23); SCARIDEA FARRANDI (PAGE 28)



SCARUS KRAUSSI (PAGE 30); OPUA NEPHODES (PAGE 36); CANTHERINES VERECUNDA (PAGE 40)